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A test of curiosity is being constructed with a view to item-content appropriateness for a population of unselected adults. Curiosity may be defined as specific or diversive. It was felt that the two were not synonymous and there was a need to differentiate between them; the test of specific curiosity under construction aims to identify the individual who reacts with positive affect toward situations high in novelty and complexity and who tends to approach them with the purpose of exploring the stimulation, reducing uncertainty, and gaining information. The construction proceeded from a theoretical description of selected characteristics and expected behaviors. Specific curiosity was conceptualized as a three-faced cube; face 1 is the nature of stimulation (complexity, novelty, ambiguity); face 2 is the nature of the response (observation, questioning, thinking); and face 3 is interests (outdoors, mechanical, computation, scientific, persuasive, artistic, literary, musical, social service, and clerical). The first data collection has been analyzed; the questionnaire has been revised; and it is expected that this revised questionnaire will be available for validity and research studies within a very few months. (eb)

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A PROGRESS REPORT ON THE DEVELOPMENT OF A TEST OF CURIOSITY

H.I. Day

Ontario Institute for Studies in Education

Paper read at 1969 National Seminar on Adult Education Research.
February 10, 1969, Toronto.

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A PROGRESS REPORT ON THE DEVELOPMENT OF A TEST OF CURIOSITY

Curiosity can be viewed both as a motivational variable and as a personality trait. In the former instance research is directed towards an examination of the parameters of the motivational state and the effects of changes in this state on various aspects of behavior. Research on curiosity as a personality trait is concentrated on the study of other personality correlates of the "curious personality" and on predictions of differential behavior by people varying along this trait under similar circumstances.

There is an implicit assumption of the commonality between personality traits and motivational tendencies, although the exact relationship has never been defined for the many trait-state variables such as anxiety, need for achievement and curiosity, Brandan Maher (1967) has put it well in the preface of a book by Heckhausen when he said that "personality psychology is, to a large extent, the study of individual differences in motivation" (Heckhausen, 1967, p.IX) and again on the same page, "over recent years the personality psychologist has become increasingly concerned with identifying the determinants of specific motives, developing methods of measuring motive strength, and is recording the vicissitudes of motive-behavior relationships".

Thus, the curious individual may be assumed to be one with a propensity for either becoming more curious under common curiosity arousing conditions, or more readily becoming curious under many different conditions or both. Such an assumption must be tested and is dependent upon the availability of adequate measures of the personality variable as well as ability to manipulate the motivational state.

Within the past few years there has been an increasing number of attempts to identify the curious personality. A quick perusal of psychological journals shows what is almost a proliferation of more or less independently developed

tests of this characteristic in members of the population. Usually tests are based on the number of questions asked about a series of drawings, peer ratings, teacher ratings and object manipulation measures.

Perhaps the pioneers in this effort were Maw and Maw (1961). They used the technique of obtaining ratings from a child's teachers and peers, as well as self-ratings, and have done extensive studies of the characteristics of high and low curious children. To guide these ratings, they defined a child as showing curiosity to the extent that he

1. reacts positively to new, strange, incongruous or mysterious elements in his environment by moving toward them, by exploring them, or by manipulating them,

2. exhibits a need or a desire to know more about himself and/or his environment,

3. scans his surroundings seeking new experiences,

4. persists in examining and exploring stimuli in order to know more about them.

Penney developed a Reactive Curiosity Scale (Penney & McCann, 1964) defining Reactive Curiosity as:

1. a tendency to approach and explore relatively new stimulus situations,

2. a tendency to approach and explore incongruous, complex stimuli,

3. a tendency to vary stimulation in the presence of recently experienced stimulation.

Following extensive research by Berlyne (1960, 1965), and the present author (Day, 1965, 1967, 1968b) it was felt that one should discriminate between two types of exploratory behavior and curiosity which are in terms of their antecedents as well as their goals and direction quite distinct. Berlyne suggested that <u>specific exploration</u> results from a state induced by the presence in the environment (or within an individual's symbolic structures) of a high level of collative variability. He defined collative variability as that property in a stimulus which is somehow strange or complex or contains a measure of

unexpectedness and uncertainty. Within the designate of collative properties he included novelty, complexity, ambiguity, incongruity, perplexity, etc., in fact, properties of the individual's reaction to stimulation based on his particular experiences and ability to compare or collate elements in the universe and in his conceptual structure with each other.

This reaction on the part of the individual embodies a state of response conflict, or difficulty in response choice. Response conflict is felt as a state of discomfort and an increase in tension or arousal resulting in intrinsic motivation to engage in responses of specifically directed exploration, or to search for information which will reduce the arousal and conflict. Specific curiosity is then defined as a motivational state induced in an organism by elements of an environment which failed to yield sufficient information for the individual to impose cognitive structure, or to select an appropriate response.

Diversive exploration, on the other hand, is said to be motivated by a stimulus situation characterized by lack of change and reduced stimulus input. Because such a situation fails to furnish new information for processing, it may engender a condition of arousal, response conflict, and uncertainty. The state of diversive curiosity thus generates a search for a more optimal information flow. Diversive exploration is directed towards excitement and risk-taking experiences, and the common activities of recreation and play.

Thus, one must refer to two types of curious individuals; the specifically curious and the diversively curious. Although little research has been done to try to distinguish between these two personality traits, it may be that there is a large overlap between the two types, for individuals who tend to expose themselves to new experiences may do so because they react positively to them and prefer their presence.

However, it was felt that these two characteristics are not completely synonymous and that therefore there is a need to distinguish in any testing

between them. In Maw and Maw's definition, most of the items can be seen as reflecting specific curiosity except point 3 obviously refers to activity of a diversive nature as does point 3 in Penney's definition. Therefore, the test of specific curiosity at present under construction by this author, proceeded from a desire to identify the individual who reacts with positive affect towards situations high in collative variability and who tends to approach them with the purpose of exploring the stimulation and reducing uncertainty and gaining information.

The definition of the specifically curious individual which has guided this research, is as follows:

1. is interested in novel, incongruous or complex objects and events in his environment.

2. reacts positively to new, strange, incongruous or mysterious elements in his environment by moving toward them, by exploring, thinking or manipulaitng them or by asking questions about them,

3. persists in thinking and exploring such stimuli in order to know more about them.

The diversively curious person, on the other hand, tends to be restless, easily bored, continuously seeking change, but possibly fails to concentrate on these situations until full understanding is reached.

The specifically curious personality is distinguished from the individual who tends to become overaroused and anxious in the face of response conflict and uncertainty and prefers to remain with the familiar and well-structured environment.

Although item 3 which deals with persistence in examining and exploring stimulation has never been tested adequately, following Maw and Maw, it was decided to incorporate this characteristic into the description of the personality.

This line of research had its source in two findings by the present author. In one of his first experiments in this area he found that preference for particular levels of visual complexity was stable over time (Day, 1965).

His second finding was that of significant individual differences among subjects on various measures of preference for complexity (Day, 1965, 1966, 1968b). These two findings lent credence to the belief of the existence of a fairly stable personality characteristic of curiosity and launched the search for a measure of this trait.

At first, research was confined mainly to the study of various reactions to visual complexity, based on earlier papers by Barron and Welsh (1952), and Ilsa Frenkel-Brunswik (1951), who had argued that preference for complexity and ambiguity in the perceptual field was related to tolerance for complexity and ambiguity in the conceptual and cognitive fields.

Different modes of response to complexity were measured and compared. It was found that the verbal response of preference or liking commonly used by most psychologists studying affective attitudes is really a synthesis of two other verbal descriptions, interesting and pleasing (Day, 1968d). These two descriptions may be unrelated to each other and may even reflect different reactions to the stimulus, interest being a reaction to arousal-inducing properties and pleasing - a reaction to arousal-miligating or arousal-reducing properties of the stimulus (Berlyne, 1963). Interest was shown to describe an inverted U-shaped relationship over complexity reaching a peak at a moderate level and tapering off with increasing complexity as illustrated in Figure 1.

Insert Figure 1 about here

This was found with different types of visual figures, the original shapes constructed by Berlyne (1963) and solid block-on-white random asymmetrical polygons (Day, 1965, 1966, 1967, 1968a), generated by this author and shown in Figures 2

Insert Figures 2 & 3 about here

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and 3. Pleasingness responses seem to be only barely related to changes in complexity (but fairly well related to the symmetry factor) and tend, if at all, to decrease linearly with complexity, as shown in Figure 4.

Insert Figure 4 about here

The term interest has often been associated with the characteristics of curiosity - excitement coupled with positive valence and attention (c.f. Hebb, 1955) and research showed that the distribution of interest resembled the distribution of looking time for figures of various levels of complexity, as well as physiological responses to those figures (Berlyne & McDonnel, 1965; Day, 1968c)

Although work with perceptual interest yielded exciting results and led to a better understanding of human attitudes and response to complexity it was felt that this direction was too restrictive. Attempts to relate this measure to measures in other fields also were sometimes unsuccessful, leading to the question of generalizability of the results. For collative variability includes novelty, incongruity, perplexity, uncertainty, as well as complexity and can be perceived in other than visual forms. Furthermore, exploration may take the form of thinking, question asking, manipulating the source of stimulation etc. Evans, in a yet incompleted thesis, for example, showed that subjects reacted similarly to contexual material, consisting of paragraphs of textbook material as they do to perceptual stimulation. Moreover, although the number of questions asked about the paragraphs did not change with complexity, the type of question did, for with increasing complexity Ss increasingly began to ask vague information-seeking questions rather than hypothesis-testing questions which simply require a yes or no answer.

A pilot project into personality testing through questionnaires produced a 36-item test measuring extent of interest and willingness to approach

a wide range of stimuli with high collative properties. This test has been used with college students and a form, with simplified wording, was used with grade 6, 7, and 8 pupils. Preliminary results have shown promise. Test-retest reliability was high and correlations with anxiety scores showed a low but significant positive relationship with the facilitatory score on the Alpert-Haber Achievement Anxiety Scale. Using the children's form of the test, positive correlations were found with teachers' ratings of curiosity, the self-reliance and sense of personal worth scales from the California Personality Inventory and with Haywood's Choice-Motivator scale, a test designed to measure the extent to which an individual is motivated to engage in activities for their own intrinsic satisfaction and how much he is motivated by rewards extrinsic to the activity itself.

However, the test itself is too brief and incomplete. It is obvious that, with adults at least, a far wider range of choices must be offered.

The particular impetus of the development of the present test comes from a desire to understand further the work motivations of individuals. Consistent unemployability of many adults in Canada has often been attributed to low IQ coupled with impoverished educational background and resultant lack of skill development. Yet there are a large number of male adults with equally low IQ from deprived or impoverished background who are able to adapt and remain steadily employed. These do not drift from job to job, unable to adjust to the complexities of urban life.

It has been argued that the differences may proceed, at least in part, from unwillingness or inability to tolerate collative variability in the environment. Thus, if an individual has an interest or positive attitude, if he is willing to approach and explore, he may be able to adjust to change and to new and complex situations. Moreover, such an individual may be the one described by Hertzberg as deriving satisfaction from the challenges of work situations inherent in the activities themselves (Hertzberg, 1959).

Furthermore, it is fairly obvious that there is some direct relationship between level of curiosity and mental health. Curious people are willing to approach and explore novel and incongruous environments, low curious people on the other hand, tend to become fearful and anxious in the presence of change and gradually withdraw from all sources of environmental change, seeing this as a possible threat to their existence.

Because of this orientation, the test in its present form is being constructed with a view to item-content appropriateness for a population of unselected adults.

The method of approach to the development of this measure received its inspiration from two sources. The first of these came from the strategy followed by Dr. D. Jackson of the University of Western Ontario, in his development of the Personality Research Form (Jackson, 1966). Jackson emphasizes as a first principle in this strategy the importance of psychological theory.

> "The importance of theory in personality test construction cannot be overemphasized. There is no substitute in the creative task of defining dimensions and of preparing personality items than a sound grasp of personality theory and research as well as a more informal informal sensitivity to the diverse ways in which psychological tendencies can be revealed in behavior..... No longer is it necessary, or even desirable, to take refuge from our psychological ignorance by relying on an external criterion, and ad hoc procedures like empirical item selection." (Page 2).

This principle was followed, and test construction proceeded, not by the usual method of selecting arbitrarily defined curious people and trying out items until a set is found to which consistently positive responses are given, but from a theoretical description of the characteristics we wished to select and the behaviors we expect to be displayed. As Dr. Jackson pointed out, such an approach has the disciplinary virtue of requiring a careful evaluation of one's notions of what these values are, and in this case it has particularly required a sensitivity to the differences expected between displays of specific and diversive exploration.

A second theorist whose work has guided the approach is J.P. Guilford. His conception of intellect on the model of a cube (Guilford, 1959) with the dimensions of each face interacting to form a number of cells, led to a similar approach to the conceptualization of specific curiosity. Two obvious 'faces' immediately suggested themselves - the nature of the stimulation and the nature of the response. Originally, the sensory mode was considered for the third face, divided into visual, auditory, olfactory, tactual, etc., but this was dropped in favor of the 'interest' dimensions derived from the Kuder Preference Record (Kuder, 1939). As has been noted, it seemed particularly necessary in a test being developed for use on a mature population that the more or less well developed interests most adults display ought to be taken into consideration in the development of items, for by then, curiosity may have been channelled into specific interest areas. Also, it can be assumed that these dimensions (outdoor, literary, mechanical, etc.) form a fairly inclusive catalogue of the areas in which a human being might be interested.

The stimulus and response faces were based on the theoretical analysis provided by Berlyne (1960, 1965). From among the varieties of collative variability which he noted, novelty, ambiguity and complexity were selected, for these, seemed to subsume the many other varieties. Thus, for the novelty

scale, new, strange, unusual or incongruous situations were selected. In writing items for the ambiguity scale, situations that are unclear, or so vague as to allow of several alternate interpretations, were selected. For complexity, an attempt was made to think of situations characterized by a heavy flow of information, e.g., crowded streets, orchestras vs. solo instruments, and so on.

Three response dimensions were isolated. Questioning includes not only verbal question-asking but general investigation - manipulation, consultation of authorities, libraries, etc. Observation covers noticing and maintaining attention, e.g., reading a book to find out what happens next is observation, whereas consulting a book to answer a question would be questioning. Thinking, the final category, included the activity of attempting to understand the situation by calling on, or reassembling and reorganizing information already in cognitive storage.

This yielded a 90-cube block, each cube having 3 faces as in Figure 5.

Insert Figure 5 about here

The cubes may be labelled, for example, N.O.T. - novelty, outdoor, thinking; or C.Me.Q. - complexity, mechanical, questioning. In addition, there are a few items specified on only 1 or 2 of the dimensions which seem to correlate well with the total. The test also includes 10 social desirability items in order to test the degree of distortion towards socially acceptable answers. Appendix I contains examples of some of the items which have already been tested and have been found to hold promise of contributing to the final questionnaire.

Other considerations were included when writing the items. For example, it was attempted to make "when I am faced by" such and such a situation implicit, if not directly stated, so the examinee may respond True or False to the resulting behavior described in the statement. Non-specific statements such as

"I would like to travel" were generally avoided. In asking for preference, the terms "interested in" or "like" were used and "pleasant" was avoided.

At present, analysis of the first data collection has just been completed. Following an intensive period of item writing and rewriting, a booth was set up at the Canadian National Exhibition last fall, and passing visitors were invited to volunteer to respond to questionnaires containing about 130 items, including the 10 social desirability items. The response was sufficiently great to permit revisions as the exhibition proceeded, based on comments of the examinees. In all, six sets of data were collected, three of which were based on "true-false" response and three on a 5-point scale ranging from "never" to "always". To date, only the "true-false" scales have been analyzed.

The item analysis calculated the biserial part-remainder correlation of each item with the total score, with the total score minus S.D. items and with each of the three scales for which it had been written. Forty-four items showed significant correlations with each of these totals and appear sufficiently promising to be retained in the completed questionnaire. Another 16 are marginally significant and apparently need revision to improve clarity, or to make them more discriminating. The items of 30 cells were discarded. These have now been rewritten and another data collection, hopefully at a community college, will be done shortly.

The second principle enunciated by Jackson concerns the importance of suppressing response style variance in the development of a personality questionnaire. He has been particularly concerned with the necessity of eliminating items which show a high correlation with the Social Desirability scale. However, the item analysis of this inventory as it stands at present indicates that rarely is the item-total correlation reduced when the S.D. items are removed from the total. It appears that the tendency to respond in the "curious" direction to an item tends not to be influenced by the social demands of the

community - or in other words that curiosity may not be necessarily socially desirable, an interesting finding in itself.

The ambiguity, complexity and novelty scales intercorrelate highly, suggesting that people who respond positively to high levels of one also respond to high levels of the other two. There are differences in the response scales, with thinking and observation showing a much closer relationship to each other than to questioning. This suggests that the tendency to observe and think for oneself may not always go along with question-asking behavior. The interest area scales appear to be uncorrelated, similar to the results in the Kuder Interest Inventory.

Jackson has also emphasized the building in, during test construction, of convergent and discriminant validity, by determining that items correlate highly with their own scales and insignificantly with the other scales. It is not necessarily the case, however, that these scales be used as independent measures. Rather, the extent to which they appear to be independent or interrelated may answer questions about the curious personality of theoretical and practical significance. For example, the 'questioning' individual is more obviously curious than the one who is quietly thinking or observing. Yet, these preliminary results suggest that the curiosity of the latter should not be overlooked. The generally low relationships among the 'interest' scales, also, comment on the question of whether or not a curious adult has a broad range of interests or a deep interest in one specific area. However, the final word on these questions will have to await further research.

Ten items constituting a pilot attempt at a new scale have been added to the questionnaire. These attempt to measure the diversively curious individual, one who is easily bored and likes a lot of activity and action around him. To the extent that specific and diversive curiosity are independent traits, these items will measure only diversive exploration. If it proves to be possib-

le to find items that do not correlate highly with the specific curiosity portion of the questionnaire one can assume that the two characteristics are indeed distinguishable.

It is expected that the revised questionnaire will be available for validity and research studies within a very few months. As part of the validation studies, the test will be correlated with other measures with which it has some sort of criterion correspondence. These tests will include the Barron-Welsh Art scale, Barron's test of complexity preference, Rokeach's test of open-mindedness, the Eysenck Personality Inventory and the earlier version of the test of specific curiosity and the perceptual test of curiosity. A validation would also be required against measures of intelligence such as the Wechsler Adult Intelligence Test and Raven's Progressive Matrices.

The validity of the measure will be best determined, however, by subjecting a number of individuals to certain experimental procedures in which there are clean-cut differential predictions for individuals high and low in curiosity. The relationship between their behavior and their test scores will indicate how well the measure predicts.

Appendix I

1.	I would like to think up sales promotions for really complicated products.....	C P T
2.	I used to ask lots of questions in science classes.....	C Sc Q
3.	I like to watch new commercials on TV.....	N P O
4.	I wish people would explain how all the different instruments in an orchestra sound so good together.....	C M Q
5.	If I read about a new product in a magazine, I want to find out all about it.....	N P Q
6.	If I come across a new word, I try to look it up in a dictionary	N L Q
7.	If I read something which puzzles me, I keep reading it until I understand it.....	A L O
8.	I like to tinker with complicated machinery.....	A Me T
9.	I would rather spend the same time solving one difficult arithmetic problem than spend it with a lot of easy ones.....	C C T
10.	I like to touch and feel a sculpture.....	N A O
11.	I would like to understand how complicated things, like watches, work.....	C Me T
12.	Strange noises make me curious.....	N S U
13.	If I see a crowd, I want to ask someone what is happening.....	C S Q
14.	It is interesting to try to figure out how an unusual piece of machinery works.....	N Me T
15.	I could think about an arithmetic puzzle for a long time.....	A C T
16.	When i'm given a new kind of problem in arithmetic, I like to think about how it might be solved.....	N C T
17.	I often wonder how they set up new office systems.....	N CI T
18.	If I make a new friend, I like to ask him all sorts of questions.	N S Q
19.	When I see a complicated piece of machinery, I like to ask someone how it works.....	C Me Q
20.	Unusual things make me curious.....	N U U
21.	If an arithmetic problem has several different solutions, I try to look at them all.....	A C O

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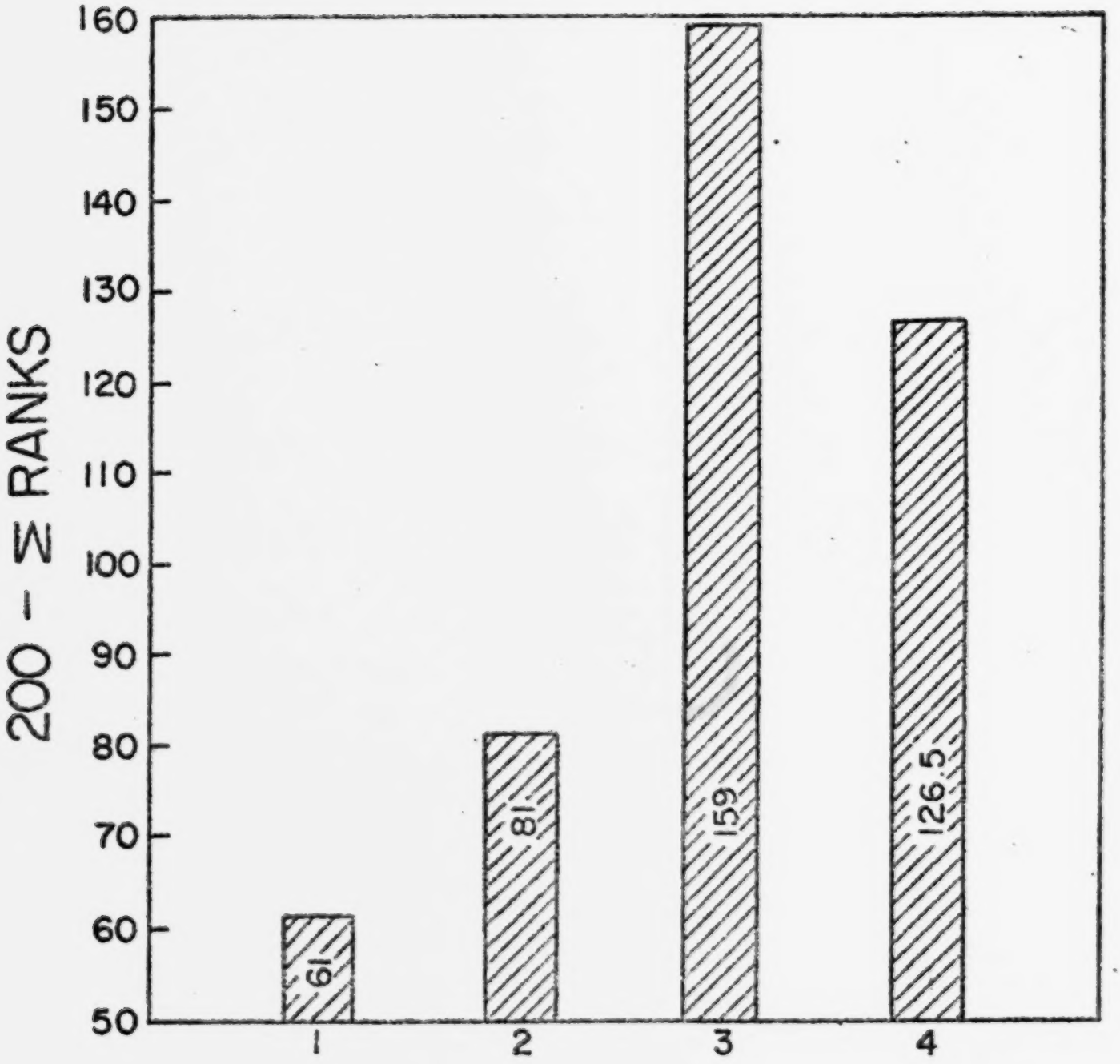
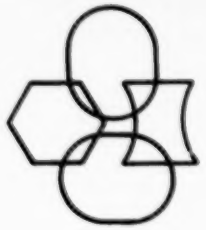


FIG. I EVALUATION OF INTERESTINGNESS RANKINGS FOR VERBAL STIMULI OF DIFFERENT LEVELS OF COMPLEXITY. (from DAY, 1965)



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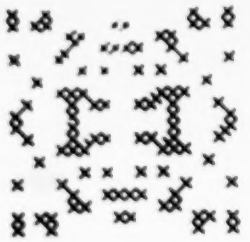

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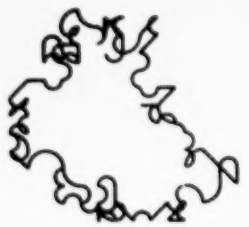

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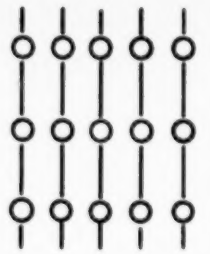

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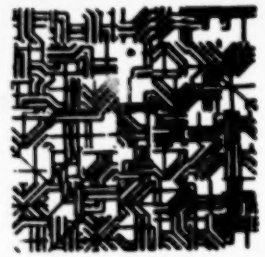

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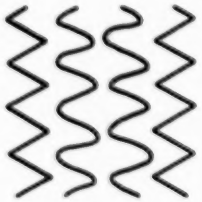

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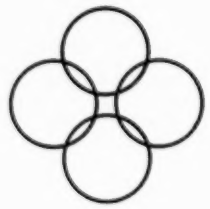

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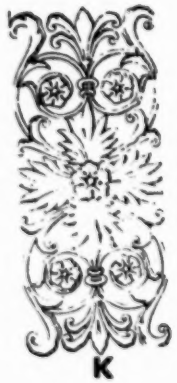

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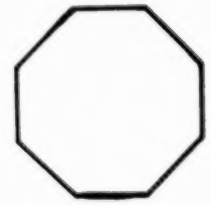

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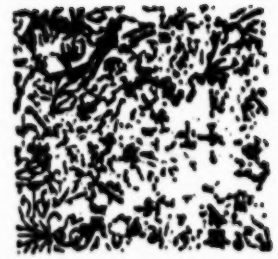

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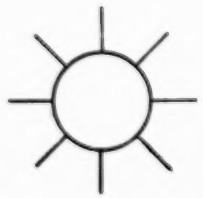

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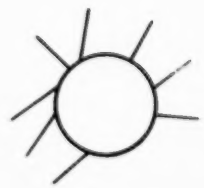

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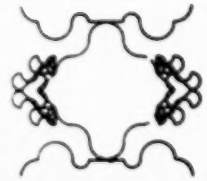

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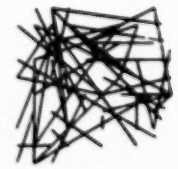

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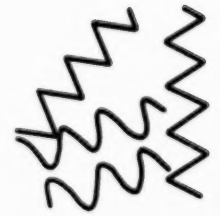

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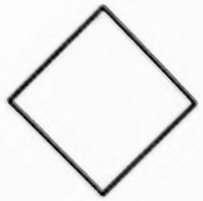

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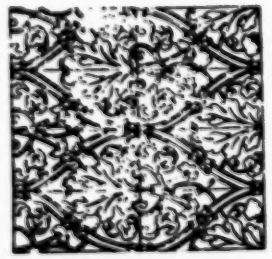

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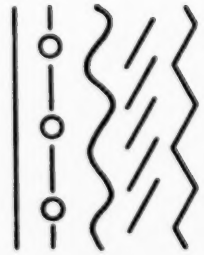

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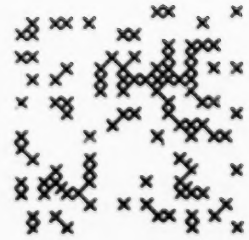

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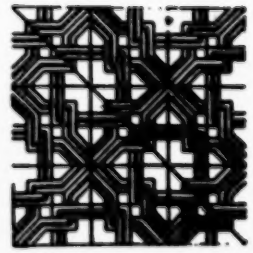

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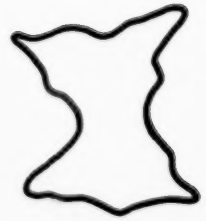

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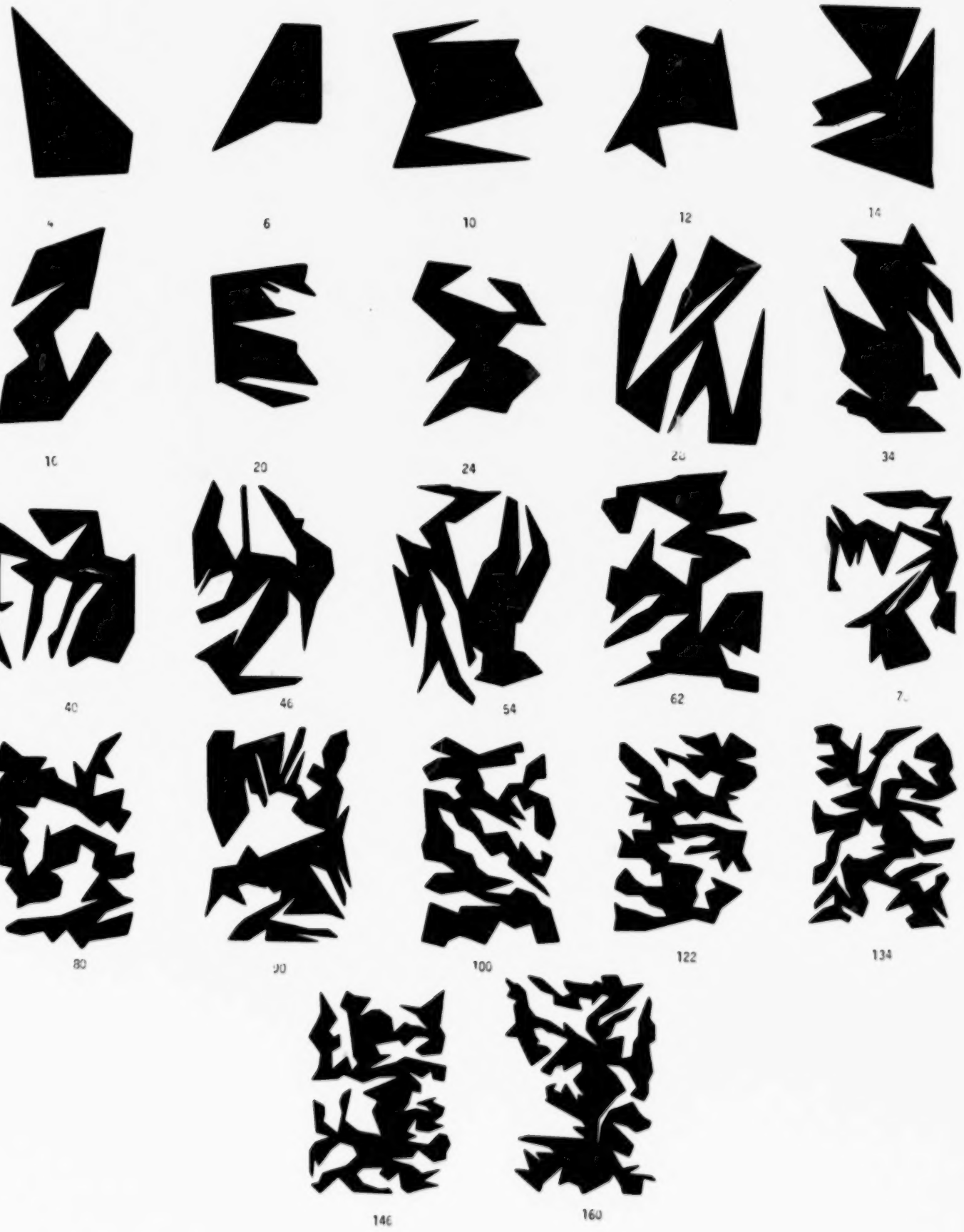
A SET OF RANDOM POLYGONS VARYING IN
LOGARITHMIC STEPS FROM FOUR TO 160 SIDES



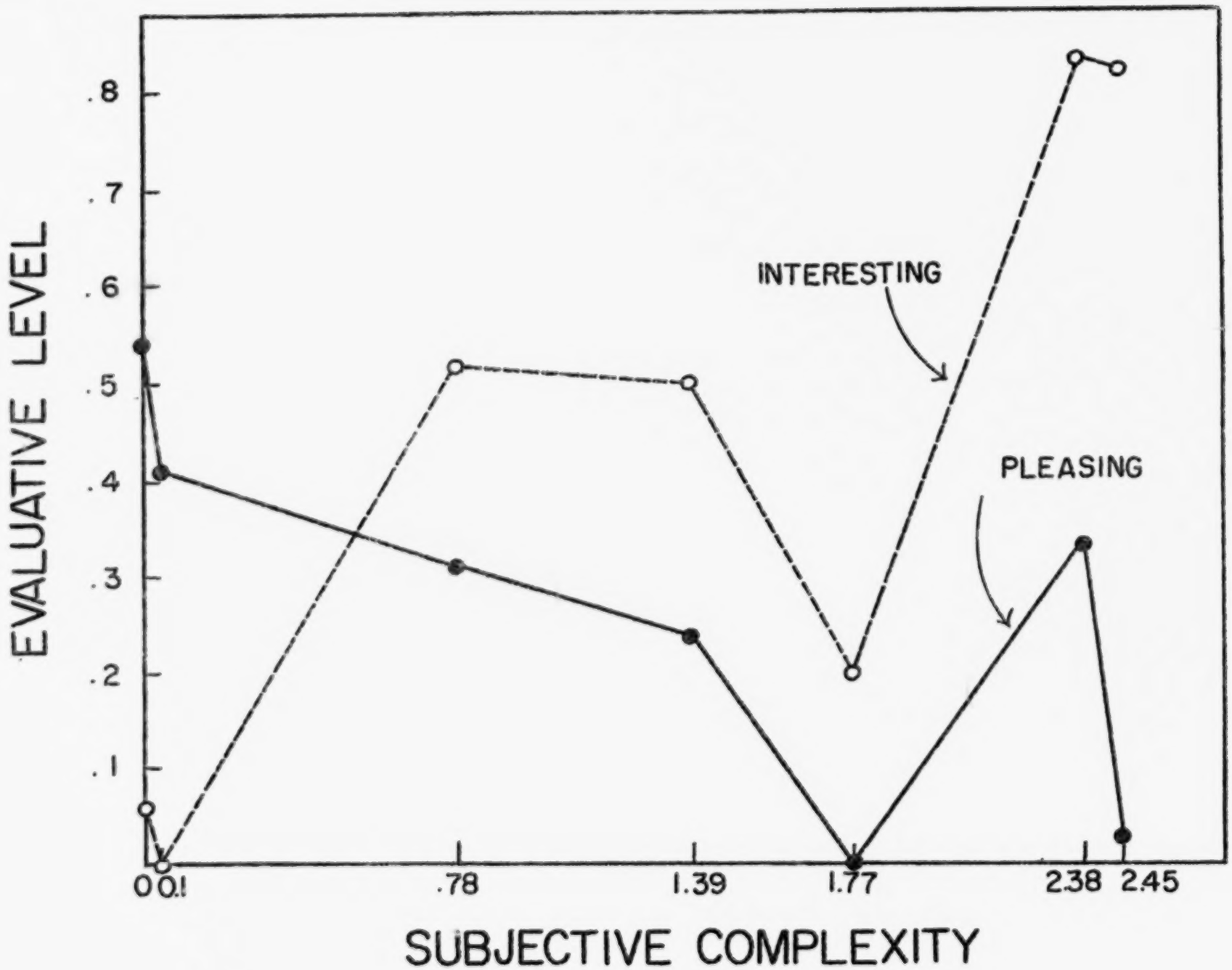


FIG. 4 SUBJECTIVE EVALUATIONS OF FIGURES VARYING IN SUBJECTIVE COMPLEXITY (STUDY I.)

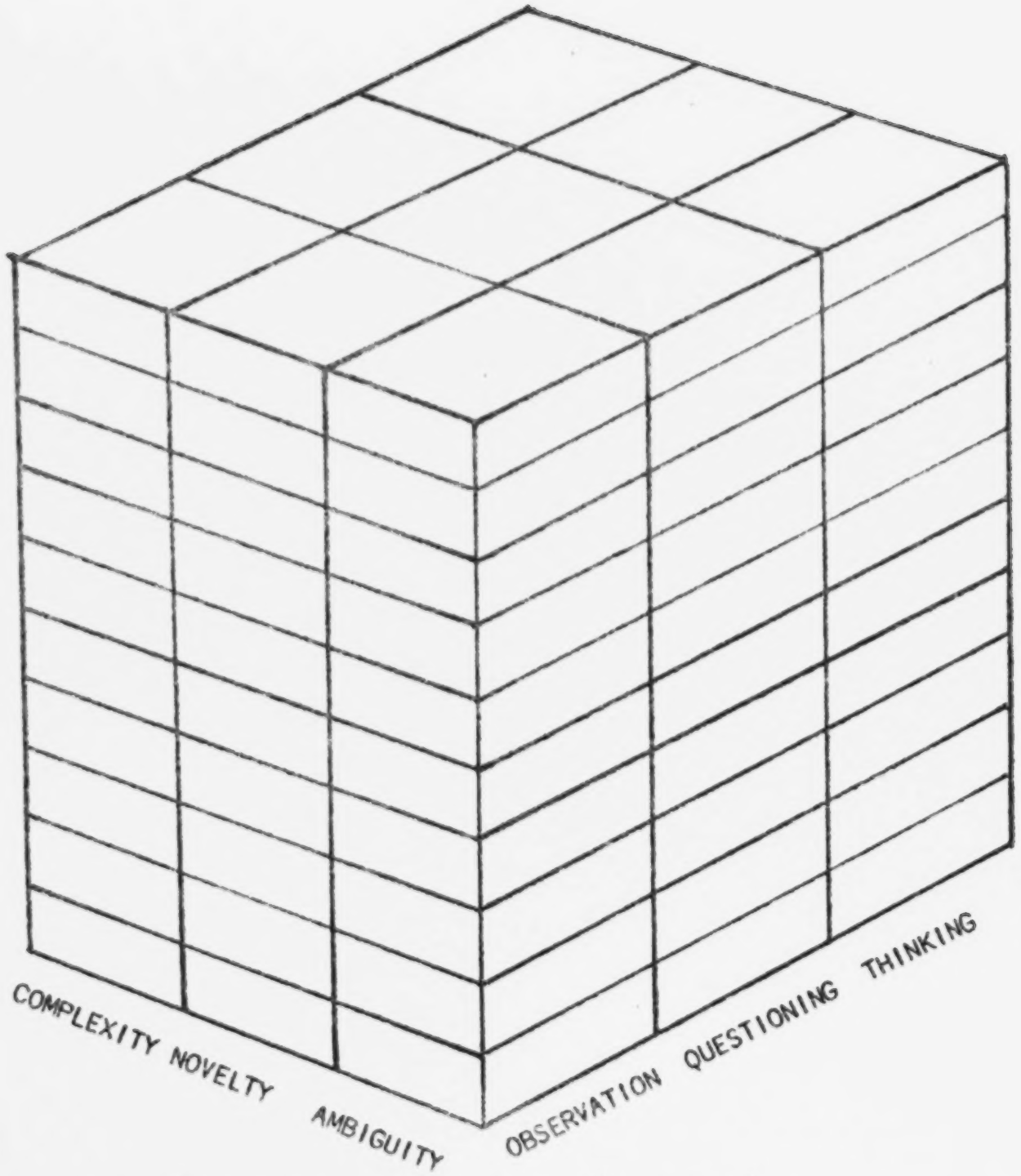


Figure 5. Three-dimensional model of "Curiosity".

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